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Crystal structure of (*E*)-7-methoxy-2-((6-methoxypyridin-3-yl)methylene)-3,4-dihydronaphthalen-1(2*H*)-one, C₁₈H₁₇NO₃

<https://doi.org/10.1515/ncrs-2021-0222>

Received June 2, 2021; accepted June 28, 2021;

published online July 13, 2021

Abstract

C₁₈H₁₇NO₃, monoclinic, *P*₂₁/*n* (no. 14), *a* = 14.702(3) Å, *b* = 7.0421(11) Å, *c* = 15.303(3) Å, β = 113.32(2)°, *V* = 1454.9(5) Å³, *Z* = 4, *R*_{gt}(*F*) = 0.0522, *wR*_{ref}(*F*²) = 0.1274, *T* = 100.03(18) K.

CCDC no.: 2092813

The molecular structure is shown in the figure. Table 1 contains crystallographic data and Table 2 contains the list of the atoms including atomic coordinates and displacement parameters.

Table 1: Data collection and handling.

Crystal:	Colourless block
Size:	0.15 × 0.13 × 0.12 mm
Wavelength:	Mo Kα radiation (0.71073 Å)
μ:	0.09 mm ⁻¹
Diffractometer, scan mode:	SuperNova,
θ _{max} , completeness:	25.5°, >99%
<i>N</i> (<i>hkl</i>) _{measured} , <i>N</i> (<i>hkl</i>) _{unique} , <i>R</i> _{int} :	5780, 2706, 0.037
Criterion for <i>I</i> _{obs} , <i>N</i> (<i>hkl</i>) _{gt} :	<i>I</i> _{obs} > 2 σ(<i>I</i> _{obs}), 2210
<i>N</i> (<i>param</i>) _{refined} :	201
Programs:	CrysAlis ^{PRO} [1], SHELX [2, 3]

Source of material

The title compound was synthesized *via* a one-pot Claisen–Schmidt condensation reaction [4]. To a stirred solution of 7-methoxy-3,4-dihydronaphthalen-1(2*H*)-one (0.52 g, 3.0 mmol) and 6-methoxy-3-pyridinecarbaldehyde (0.41 g, 3.0 mmol) in methanol (10 mL), 20% NaOH solution (3 mL) was added. The mixture was stirred at room temperature for 5 h. The process of the reaction was monitored by thin layer chromatography (TLC). The yellow precipitated solids were collected by filtration, washed with 5 mL of cold methanol and dried in vacuum. The crude product was purified by column chromatography using petroleum ether and ethyl acetate (2:1, *v/v*). Crystals were prepared by slow evaporation of methanol solution under ambient temperature.

Experimental details

The C–H atoms were then constrained to ideal geometries with C–H distances of 0.93–0.97 Å. The *U*_{iso} values of the hydrogen atoms of methyl groups were set to 1.5*U*_{eq}(C) and the *U*_{iso} values of all other hydrogen atoms were set to 1.2*U*_{eq}(C).

Comment

Chalcone and its various derivatives have attracted intense interest not only due to the widespread distribution in plants,

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Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²).

Atom	x	y	z	<i>U</i> _{iso} */ <i>U</i> _{eq}
C1	0.60522 (13)	0.1959 (3)	0.74043 (13)	0.0209 (4)
C2	0.58280 (13)	0.0543 (3)	0.80206 (13)	0.0203 (4)
C3	0.48628 (13)	0.0807 (3)	0.81337 (14)	0.0246 (5)
H3A	0.493063	0.182582	0.858191	0.029*
H3B	0.470026	−0.034743	0.838653	0.029*
C4	0.40264 (14)	0.1283 (3)	0.71743 (15)	0.0271 (5)
H4A	0.391924	0.021682	0.674354	0.033*
H4B	0.341807	0.150548	0.726427	0.033*
C5	0.35718 (14)	0.4364 (3)	0.62377 (13)	0.0243 (4)
H5	0.291225	0.416245	0.613545	0.029*
C6	0.38296 (14)	0.5988 (3)	0.58844 (14)	0.0264 (5)
H6	0.334722	0.687687	0.555707	0.032*
C7	0.48127 (14)	0.6295 (3)	0.60179 (13)	0.0238 (4)
C8	0.55255 (13)	0.4971 (3)	0.64931 (13)	0.0223 (4)
H8	0.617785	0.515581	0.656541	0.027*
C9	0.52652 (13)	0.3344 (3)	0.68674 (13)	0.0203 (4)
C10	0.42824 (13)	0.3020 (3)	0.67457 (13)	0.0216 (4)
C11	0.64810 (13)	−0.0856 (3)	0.83997 (13)	0.0213 (4)
H11	0.701958	−0.088119	0.822580	0.026*
C12	0.64561 (13)	−0.2361 (3)	0.90567 (13)	0.0207 (4)
C13	0.61552 (14)	−0.2073 (3)	0.97986 (14)	0.0232 (4)
H13	0.593660	−0.086562	0.986845	0.028*
C14	0.64567 (13)	−0.5127 (3)	1.03041 (13)	0.0227 (4)
C15	0.67955 (13)	−0.5589 (3)	0.95984 (14)	0.0238 (4)
H15	0.700922	−0.681162	0.954833	0.029*
C16	0.68035 (13)	−0.4186 (3)	0.89816 (13)	0.0220 (4)
H16	0.703933	−0.444214	0.851255	0.026*
C17	0.62767 (15)	−0.5983 (3)	1.17267 (15)	0.0311 (5)
H17A	0.669149	−0.492383	1.203339	0.047*
H17B	0.641718	−0.702547	1.216473	0.047*
H17C	0.559400	−0.562400	1.152595	0.047*
C18	0.59711 (14)	0.8274 (3)	0.57214 (15)	0.0292 (5)
H18A	0.642524	0.824837	0.637674	0.044*
H18B	0.600831	0.948658	0.545038	0.044*
H18C	0.614129	0.729117	0.537841	0.044*
N1	0.61569 (11)	−0.3415 (2)	1.04243 (11)	0.0240 (4)
O1	0.49892 (10)	0.79735 (18)	0.56603 (10)	0.0313 (4)
O2	0.68674 (9)	0.20122 (18)	0.73600 (10)	0.0281 (4)
O3	0.64672 (10)	−0.65428 (18)	1.09140 (9)	0.0271 (3)

but also because of their potential biological properties including antimicrobial, antifungal, anti-inflammatory, antioxidant and anti-mutagenic activities [5–8]. Generally, each chalcone is composed of two aromatic rings and a three-carbon α,β -unsaturated carbonyl system. The pharmacophore of α,β -unsaturated keto possesses a characteristic functionality, which can bind bio-thiols from susceptible neoplasms with lower toxicity toward normal cell [9]. In order to synthesize novel pharmaceutical agents, the aryl rings of chalcones may be modified by functional groups to improve

their biological activities [10–12]. As an important class of compounds, 3,4-dihydronaphthalen-1(2*H*)-ones were used to synthesize chalcone derivatives and the corresponding compounds possess important biological activities [13, 14]. As one chalcone analogue, (2*E*)-2-(3,4-dichlorobenzylidene)-7-hydroxy-3,4-dihydronaphthalen-1(2*H*)-one was shown to act as a potent inhibitor of the monoamine oxidase enzymes [15]. It was reported that some chalcone-like derivatives containing 6-methoxy-3,4-dihydronaphthalenone possessed potential antioxidant properties [16]. Additionally, chalcones with methoxy groups and pyridine groups demonstrated antibiotic-resistant bacteria [17]. However, it is rarely reported that 3,4-dihydronaphthalenone-based chalcones can be used to treat neuroinflammatory diseases [18]. As a part of our continuing study on anti-neuroinflammatory agents for the treatment of inflammatory diseases in the central nervous system, a new chalcone with 3,4-dihydronaphthalen-1(2*H*)-one and functional groups of methoxy was designed and synthesized.

X-ray crystallographic analysis shows that the title compound contains one independent molecule in the asymmetric unit (*cf.* the figure). All bond lengths and bond angles are all in the normal ranges [19–21]. Due to the arrangement of the pyridine ring and carbonyl group around the C2=C11 olefinic bonds, the title compound adopts the *E* stereochemistry. In the molecule, the cyclohexenonyl ring of the 3,4-dihydronaphthalen-1(2*H*)-one shows a half-chair conformation, which may be attributed to the conjugated relationship of the carbonyl group with the adjacent benzo moiety. The pyridyl and the benzo moiety enclose a dihedral angle of 59.56(7)°. There are no classical hydrogen bonds found in the crystal, but molecules are connected to form layer structures through weak C18–H18B...O1 and C18–H18A...O2 hydrogen bonds. It is remarkable that the dihydronaphthalenone and methoxy group of the title compound can increase molecular lipophilicity and may effectively establish hydrophobic interactions with certain proteins. The unique structure will enable the title compound to possess a potential property in bioactivities.

Author contributions: All the authors have accepted responsibility for the entire content of this submitted manuscript and approved submission.

Research funding: This work was supported by Project of the Shandong Province Higher Educational Science and Technology Program (No. J18KA092).

Conflict of interest statement: The authors declare no conflicts of interest regarding this article.

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